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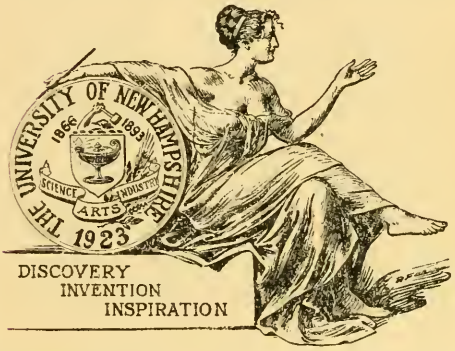

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NEW HAMPSHIRE
AGRICULTURAL EXPERIMENT STATION
DEPARTMENT OF AGRICULTURAL CHEMISTRY

Inspection of Commercial Fertilizers for 1922

MADE FOR THE

STATE DEPARTMENT OF AGRICULTURE

By H. R. KRAYBILL, T. O. SMITH and C. P. SPAETH

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NEW HAMPSHIRE COLLEGE
OF
AGRICULTURE AND THE MECHANIC ARTS
DURHAM, N. H.

Inspection of Commercial Fertilizers

This bulletin is a report of the results obtained in the annual inspection of commercial fertilizers made by the State Department of Agriculture under the direction of the Honorable Andrew L. Felker, Commissioner of Agriculture. The State Inspector, Mr. Eugene D. Sanborn, visited practically every section of the state and collected samples of 97 brands.

The relatively smaller number of low grade fertilizers found this year shows a decided improvement over that of last year. In 1921 out of a total of 104 samples 35, or over 33 per cent., of the brands contained less than a total of 14 pounds of plant food per 100 pounds, while in 1922 only 23 brands out of 97, or approximately 24 per cent., contained less than 14 pounds of plant food per 100 pounds of fertilizer. There is still a chance for a decided improvement in this regard. For instance in the 1-8-2 fertilizers the cost of nitrogen per pound was over four times as great as in the 5-8-7 brands. Because it costs just as much to mix, bag and ship a ton of low grade as it does a ton of high analysis fertilizer, the total cost per pound of plant food is much cheaper in the high analysis goods. *Ask for high analysis fertilizer. Do you consider the actual plant food value of the fertilizer when you buy? The object of the following discussion is to aid you in purchasing fertilizers.* READ IT! USE IT WHEN YOU BUY FERTILIZERS! The following discussion of the meaning of the analysis and the methods of calculating relative values are given to aid you in purchasing fertilizers. If you need further help write to the Department of Agricultural Chemistry, the New Hampshire State College Agricultural Experiment Station, Durham, N. H.

MEANING OF THE CHEMICAL ANALYSIS

Three of the ten elements essential for plant growth are most likely to be lacking in sufficient available quantity for best crop growth in our usual soils. These are nitrogen, phosphorus and potassium. Sometimes calcium, magnesium and sulphur may be deficient, but because these deficiencies have apparently not been marked and widespread, our fertilizer practices have dealt largely with the application of nitrogen, phosphorus and potassium. The value of commercial fertilizers depends, therefore, upon their available content of these three elements. For this reason manufacturers are required to state upon their label the guaranteed content of these three materials.

Nitrogen. Pure nitrogen is a colorless, odorless, tasteless gas which makes up about four-fifths of the air surrounding us. In this form, however, it is not available to plants with the exception of a few, such as legumes, which are able to get nitrogen from the air by means of the bacteria which exist upon their roots. In order to be available for most plants nitrogen must be in the form of a compound known as a nitrate.

In commercial fertilizers the nitrogen occurs in three different forms as follows: (1) nitrate, (2) ammonia and (3) organic nitrogen. The nitrate nitrogen is readily soluble in water and immediately available to the plant. The ammonia nitrogen and organic nitrogen must be converted into the nitrate form before they are available to the plant. The ammonia nitrogen becomes available quite rapidly during the growing season and so can be considered as an available form. Some types of organic nitrogen such as are contained in dried blood, cottonseed meal, tankage, etc., are also rapidly converted into nitrate nitrogen in the soil and made available to the plant. Other types of organic nitrogen like those contained in hoof, hair and leather waste, however, are only very slowly converted into nitrate nitrogen and are not readily available.

Phosphorus occurs in the various fertilizer materials principally as phosphoric acid in combination with calcium (lime.) In order to be available to plants these compounds of lime and phosphorus must be soluble or made soluble. The amount of lime combined with the phosphoric acid determines the solubility; the material containing the smallest amount of lime is the most soluble. That part of the phosphoric acid which is readily soluble in water is immediately available to the plant during the growing season. This is known as "water soluble" phosphoric acid. A part of the phosphoric acid which is insoluble in water is soluble in a certain strength of ammonium citrate solution. This is known as "citrate soluble" or "reverted" phosphoric acid. This is also available to the plant. In the analysis the "available" phosphoric acid includes the "water soluble" and the "citrate soluble." The insoluble may be obtained by subtracting the available from the total in the tables of analyses. The "insoluble" phosphoric acid becomes available to the plant only very slowly.

Potassium occurs in commercial fertilizers usually in the form of chloride (muriate) or sulphate. Only the water soluble potassium is readily available to plants. The analysis, therefore, expresses the percentage of "water soluble" potash (K_2O).

Statement of the Analysis. There are numerous ways of expressing the amounts of nitrogen, phosphoric acid and potash contained in a fertilizer. The purchaser should not be misled by these statements. For instance, if a fertilizer contains 3 per cent. of nitrogen, it may be expressed as nitrogen 3 per cent., as nitrogen equivalent to 3.63 per cent. ammonia or as nitrogen equivalent to 14.1 per cent. of ammonium sulphate. The per cent. of nitrogen is the thing which is important and is the figure which should be used in calculating the value of a fertilizer. The following shows how to calculate the per cent. of nitrogen from the per cent. of ammonia and vice versa. The nitrogen per cent. multiplied by 1.21584 gives the per cent. of ammonia.

The per cent. of ammonia multiplied by 0.82247 gives the per cent. of nitrogen. Do not be misled by thinking that a tag stating 3.29 per cent. of nitrogen and nitrogen equivalent to 4 per cent. of ammonia means that the fertilizer contains the sum of these two. It does not. It means that the fertilizer contains 3.29 per cent. of nitrogen only.

For convenience, phosphorus is expressed as per cent. of "phosphoric acid" or P_2O_5 (Phosphorus pentoxide). The tag usually gives the total per cent. of "phosphoric acid," the "water soluble," "citrate soluble" and "insoluble." For the purpose of figuring out the value of these we can take the sum of the "water soluble" and the "citrate soluble" and call it available phosphoric acid. The per cent. of available phosphoric acid is the figure to use in determining the value of the fertilizer. Potassium is expressed as per cent. of available K_2O or potash. This is water soluble and available to the plant.

METHOD OF CALCULATING THE RELATIVE COMMERCIAL VALUE

Because of the variations of prices during the season and the differences in freight costs, etc., it is difficult to calculate accurately the values of the different brands of fertilizer. The commercial value of a fertilizer is based upon the content of available nitrogen, phosphoric acid (P_2O_5) and potash (K_2O). If we know the guaranteed analysis and assign approximate commercial values for a pound of each of the plant foods, we can calculate the relative values of fertilizers.

The terms "unit" of nitrogen, "unit" of phosphoric acid and "unit" of potash are sometimes used to express the amounts instead of the per cent. The term "unit" means 20 pounds per ton (2,000 pounds) or 1 per cent. One unit means 1 per cent. of a ton or 20 pounds. A fertilizer having 4 per cent. of nitrogen has four units of nitrogen or 80 pounds per ton.

Prices of Plant Foods. It is impossible to give accurate figures for the cost of the different plant foods because the cost of mixing, bagging, freight and the manufacturers' and dealers' profits vary with the quantity purchased, distance shipped and number of persons through whose hands the material has passed. It is possible, however, to obtain figures which are sufficiently accurate for use in comparing the relative values of fertilizers.

The average cost of acid phosphate containing 16 per cent. of phosphoric acid was $23.75 per ton. One ton contained 0.16 times 2,000 pounds or 320 pounds of available phosphoric acid. The cost per pound was $23.75÷320 or approximately $0.074 and one unit of available phosphoric acid cost 20×$0.074 or approximately $1.48.

The average cost of muriate of potash containing 48 per cent. of water soluble potash was $65.00 per ton. One ton contained .48 times 2,000 pounds or 960 pounds of potash. The cost per pound was $65.00÷960 or $0.0675 and one unit of water soluble potash cost 20×$0.0675 or $1.35.

The average cost of nitrate of soda containing 15 per cent. nitrogen was $65.00 per ton. One ton contained 0.15×2,000 or 300 pounds of nitrogen; this made the cost $65.00÷300 or approximately $0.22 per pound and the price per unit 20×$0.22 or $4.40. The average cost of tankage was $50.00 per ton and it contained an average of 5.00 per cent. of nitrogen and 5.50 per cent. available phosphoric acid. The value of the 5.50 units of phosphoric acid was 5.50×$1.48 or $8.14, making the nitrogen cost $50.00 minus $8.14 or $41.86. The cost per unit of nitrogen was $41.86÷5.00 or $8.37 and the cost per pound of nitrogen $0.418. If we assume that our complete fertilizers contain both forms of nitrogen, we can approximate an average and use the values of $0.32 per pound and $6.40 per unit for nitrogen of complete fertilizers. These figures will not give the price at which fertilizers should be sold within the state, but they can be used to determine the relative value of the different brands which may be offered to the purchaser.

PRICES OF PLANT FOOD MATERIALS

	Per unit	Per pound
Nitrogen	$6.40	$0.32
Phosphoric acid (P_2O_5) available	1.48	0.074
Potash (K_2O) water soluble	1.35	0.0675

Either the unit or the pound method can be used to calculate the commercial value of the fertilizer. If we have a fertilizer with the following guaranteed analysis:

Nitrogen total	3.00%
Phosphoric acid (P_2O_5) available	8.00%
Potash (K_2O) water soluble	2.00%

By the unit method we find:

Nitrogen	3×$6.40=$19.20
Phosphoric acid available	8× 1.48= 11.84
Potash (K_2O) water soluble	2× 1.35= 2.70
Total commercial value	$33.74

By this method we multiply the per cent. of each plant food by the cost per unit and then add these figures to give the total value.

Employing the pound method we obtain:

3×20=Number of pounds of nitrogen in a ton	60×$0.32 =$19.20
8×20=Number of pounds of phosphoric acid in a ton	160× 0.074 = 11.84
2×20=Number of pounds of potash water soluble in a ton	40× 0.0675= 2.70
Total commercial value	$33.74

The per cent. means the number of pounds in 100 pounds. Since there are twenty hundred pounds in a ton we multiply the per cent. by twenty to find the number of pounds of each plant food in a ton. Then by knowing the value of these per pound, we can figure the value of each plant food per ton.

BUY HIGH ANALYSIS FERTILIZERS

The content of available nitrogen, phosphoric acid (P_2O_5) and potash (K_2O) determines the value of a commercial fertilizer. Because it costs just as much to mix, bag and to ship a ton of low grade fertilizer as it does a ton of high grade fertilizer, the cost of the same amount of plant food must be much higher in the low grade fertilizer.

The average cost of a 1-8-2 fertilizer the past season was $45.50 and the average analysis 0.97 per cent. nitrogen,

8.11 per cent. available phosphoric acid and 2.49 per cent. available potash. The value of the 8.11 units of phosphoric acid was 8.11× $1.48 or $12.00. The value of the 2.49 units of potash was 2.49×$1.35 or $3.36. The value of the available phosphoric acid and potash was $12.00 plus $3.36 or $15.36 and the nitrogen cost $45.50 minus $15.36 or $30.14. The average content of nitrogen was 0.97 per cent. One ton then contained 0.0097×2000 or 19.4 pounds of nitrogen. The cost per pound of nitrogen was $30.14 ÷19.4 or $1.55 and the cost per unit was 20× $1.55 or $31.00. On the same basis the average cost per unit of nitrogen in the 5-8-7 fertilizer was $7.61 or approximately one-fourth as much. *It pays to compare the relative values when purchasing fertilizer. The high analysis fertilizers furnish the plant food at a lower cost than the low analysis goods.* Table No. 1 gives the cost of nitrogen in the different brands of complete fertilizers and sheep manures analyzed during the past season.

TABLE NO. I

Relative Cost of Nitrogen in the Various Complete Fertilizers and Sheep Manures

Formula	Number of lbs. of plant food per 100 lbs. of fertilizer	Average cost of one pound of nitrogen	Average cost of one unit of nitrogen	Average retail price per ton
1—8—2	11	$1.55	$31.00	$45.50
2—8—2	12	0.92	18.39	45.14
2—8—3	13	0.88	17.52	46.43
2—8—4	14	0.69	13.89	46.00
3—8—3	14	0.60	12.00	46.50
3—9—2	14	0.71	14.26	51.00
2—10—3	15	0.68	13.51	45.00
3—8—4	15	0.69	13.87	53.80
2—8—6	16	0.86	17.24	50.00
2—10—4	16	0.84	16.79	49.00
4—8—4	16	0.47	9.38	48.85
6—6—4	16	0.43	8.66	57.50
3—8—6	17	0.60	12.04	53.00
4—8—5	17	0.42	8.48	50.00
5—8—4	17	0.38	7.61	53.00
4—8—6	18	0.54	10.77	56.00
3—6—10	19	0.70	14.03	55.00
4—8—7	19	0.46	9.23	47.50
6—8—5	19	0.48	9.69	67.00
2—8—10	20	0.60	12.02	48.00
4—6—10	20	0.52	10.36	57.66
5—8—7	20	0.38	7.61	53.00
10—3—8	21	0.31	6.28	71.00
Sheep Manure		1.55	31.00	56.25

CLASSIFICATION OF SAMPLES ANALYZED

Table Number II gives the number of samples collected and analyzed in each of the respective classes.

TABLE NO. II

Complete Fertilizer	71
Ammoniated Superphosphate	1
Plain Superphosphate	6
Phosphate and Potash	2
Sheep Manure	5
Ground Bone	4
Nitrate of Soda	3
Muriate of Potash	2
Tankage	2
Sulphate of Ammonia	1
Total	97

COMPLETE FERTILIZERS

Table No. III shows the average analysis and retail prices for the brands of complete fertilizers analyzed. There were seventy-one samples of complete fertilizers representing about the same proportion of the total number as in 1921. There were a smaller per cent. of the low analysis and a few of the higher analysis brands than in 1921.

TABLE NO. III

Formula	Number of brands	Average per cent. of nitrogen	Average per cent. of total phosphoric acid	Average per cent. of available phosphoric acid	Average per cent. of water soluble potash	Average price per ton
1—8—2	2	0.97	9.53	8.11	2.49	$45.50
2—8—2	14	1.69	9.74	7.42	2.28	45.14
2—8—3	7	1.73	9.72	7.99	3.18	46.43
2—8—4	1	2.03	10.88	8.00	4.41	46.00
2—8—6	2	1.74	9.23	8.04	6.00	50.00
2—8—10	1	1.88	9.00	8.04	10.00	48.00
2—10—3	1	2.03	17.58	8.66	3.52	45.00
2—10—4	1	1.64	12.56	10.85	4.00	49.00
2—10—6	1	1.78	11.24	10.41	6.00	
3—6—10	2	2.28	7.30	6.24	10.19	55.00
3—8—3	2	2.47	9.84	8.58	3.07	46.50
3—8—4	5	2.57	10.10	8.46	4.17	53.80
3—8—6	2	2.66	10.48	8.59	6.12	53.00
3—9—2	2	2.47	10.21	8.61	2.25	51.00
4—6—10	7	3.36	7.63	6.13	10.19	57.66
4—7—2	1	3.35	10.54	8.59	2.07	80.00
4—8—4	8	3.43	9.77	8.19	4.11	49.85
4—8—5	1	3.63	16.64	8.42	5.00	50.00
4—8—6	1	3.36	9.96	7.79	6.13	56.00
4—8—7	2	2.97	9.22	7.83	6.28	47.50
5—8—4	1	3.91	10.06	7.45	4.63	53.00
5—8—7	2	4.10	9.61	7.83	7.54	53.00
6—6—4	3	4.92	8.09	6.16	4.25	57.50
6—8—5	1	5.00	11.08	7.64	5.35	67.00
10—8—8	1	8.22	8.66	5.46	8.34	71.00

The wide range of prices shows the necessity of selecting fertilizers carefully in order to obtain the most plant food for the dollar.

ACIDULATED PHOSPHATES

Six brands of acid phosphates were analyzed which showed from 15.59 to 16.87 per cent. available phosphoric acid. The price ranged from $22.00 to $35.00 per ton. *This wide range in prices again emphasizes the need of careful selection in buying fertilizers.*

SHEEP MANURE TOO EXPENSIVE

Five brands of sheep manures were analyzed which averaged 1.67 per cent. nitrogen, 1.18 per cent. phosphoric acid and 2.08 per cent. potash. The price ranged from $50.00 to $65.00 per ton, averaging $56.25. Figuring their value

on the basis of the cost of phosphoric acid at $1.48 per unit, potash at $1.35 per unit and nitrogen at $6.40 per unit we find the average value of these sheep manures to be $15.24 per ton. *Their cost was nearly four times their commercial value.*

DEFICIENCIES IN ANALYSIS

Twenty-two brands out of 97 analyzed or 22.6% showed a deficiency of 0.2 per cent. or more in one or more of the plant foods, nitrogen, phosphoric acid and potash. In 1921 forty-one per cent. of the samples showed deficiencies. There is a decided improvement this year but it still indicates a serious loss to the farmer using the brands which showed these deficiencies.

ANALYSES OF BRANDS

The following table shows the detailed results of the analyses of the different brands. In the table the names of the manufacturers are arranged alphabetically and under the name of each manufacturer the different brands are arranged alphabetically.

Analyses of Brands.

	NITROGEN		PHOSPHORIC ACID				POTASH	
			Total		Availa.			
	Guaranteed	Found	Guaran-teed	Found	Guaran-teed	Found	Guaranteed	Found
American Agricultural Chemical Company, New York City								
Bradley's Blood, Bone and Potash	4.11	4 11	9.00	9.44	8.00	8.00	7.00	7.46
Brad ey's Complete Manure for top dressing, grass and grain	4.94	4.78	7.00	7.10	6.00	6.04	4.00	4.17
Bradley's Corn Phosphate	1.65	1 65	9.00	9.28	8.00	7.56	2.00	2.13
Brad.ey's Eclipse Phosphate	0 82	1.13	9.00	9.90	8.00	8.42	2.00	2.45
Bradley's Northland Potato Grower	3.29	3.33	9.00	9.90	8.00	8.15	4.00	4.35
Bradley's Potato Fertilizer	1 65	1.78	9.00	9.66	8.00	8.00	3.00	3.00
Bradley's Potato Manure	2.47	2 47	9.00	10.08	8.00	8.18	4.00	4.26
Bradley's XL Super Phosphate of Lime	2.47	2.47	10.00	9.96	9.00	8.67	2.00	2.17
Complete Manure with 10% Potash	3.29	3 62	7.00	7.65	6.00	6.09	10.00	10.00
Grass and Lawn Top Dressing	4.94	4.94	7.00	8.76	6.00	6.63	4.00	4.19
Grass and Oats Fertilizer	....	.....	13.00	13.77	12.00	12 09	2.00	2.72
High Grade Acid Phosphate	....	.....	17.00	18.08	16.00	15.73	.....	.....
Listers Corn and Potato Fertilizer	1.65	1.79	9.00	9.90	8.00	8.05	3 00	3.00
Listers Success Fertilizer	1.65	1.56	9.00	9.93	8.00	8.08	2.00	2.28
Monarch Potato Manure	3.29	3.30	9.00	10.02	8.00	8.00	4.00	4.16
Muriate of Potash	....	.....	.....	.....	.....	.....	48.00	48.38
Nitrate of Soda	15.00	15.20	.....	.....	.....	.....	.....	.....
Pacific Potato Special	1.65	1.78	9 00	9.60	8.00	8.00	3.00	3.18
Patapsco Matchless Potash Manure	1.65	1.65	9.00	9.64	8.00	8.08	2.00	2.32
Quinnipiac Corn Manure	1.65	1.65	9.00	9.96	8.00	8.00	2.00	2 31
Quinnipiac Potato Phosphate	1 65	1.65	9.00	10.18	8.00	8.03	3.00	3.62
Soluble Pacific Guano	1.65	1.77	9 00	9.68	8.00	8.00	2.00	2.36
Special Ground Bone	2.06	2.43	22.88	23.50	.....	.....	.....	.....
Williams and Clark Americus Corn Phosphate	1.65	1 69	9.00	9.42	8.00	7.88	2.00	2.18

ARMOUR FERTILIZER WORKS **Chrome, N. J.**								
Armour's 3—8—4	2.47	2.63	8.50	9.45	8.00	8.54	4.00	4.17
Armour's 16% Acid Phosphate	....	.....	16.50	16 63	16.00	15.79	.....	.....
Armour's 2—10—6 Big Crop Fertilizer	1.65	1 78	10.50	11.24	10.00	10.41	6.00	6.00
Armour's 4—6—10 Big Crop Fertilizer	3.29	3.29	6.50	7.71	6.00	5.75	10.00	10 00
Armour's Corn Grower	1.65	1.65	8.50	8.98	8.00	8.32	2.00	2.41
Armour's Potato and Onion	3 29	3.93	8 50	9.80	8.00	8.69	4.00	4.19
Armour's Sheep Manure	1.23	1.23	1.00	1.30	.....	.....	2.50	2.50
Nitrate of Soda	14.81	15.65	.....	.....	.....	.....	.....	.....
BOWKER FERTILIZER CO. **Boston, Mass.**								
Bowker's 16% Acid Phosphate	....	.....	17 00	18.59	16.00	16.30	.....	.....
Bowker's All Round Fertilizer	2.47	2.47	9.00	10 26	8.00	8.28	4.00	4.11
Bowker's Corn, Grain and Grass Phosphate	1.65	1.65	9.00	9.96	8.00	8.00	2.00	2.32
Bowker's Hill and Drill Phosphate	2 47	2.47	10.00	10.46	9.00	8.56	2 00	2.34
Bowker's Potato and Vegetable Phosphate	1.65	1.89	9.00	9.90	8.00	8.04	3.00	3.26
Bowker's Sure Crop Phosphate	0.82	0.82	9.00	9 17	8.00	7.81	2.00	2.54
Maryland Truck Garden Fertilizer	3.29	3 31	9.00	9.47	8.00	7.59	4.00	4.00
Stockbridge Market and Garden Manure	3.29	3.38	9.00	9.87	8.00	8.25	4 00	4.06
Stockbridge Potato and Vegetable Manure	3.29	3.36	7.00	7.50	6.00	6.00	10.00	10.00
Stockbridge Top Dressing and Forcing Manure	4.94	5.06	7.00	8.41	6.00	5.83	4.00	4.40
JOSEPH BRECK AND SONS **Boston, Mass.**								
Sheep Manure, Ram's Head Brand	1.84	1.45	1.25	0.96	0.75	0.80	3.00	1.99
BURLINGTON RENDERING COMPANY **Burlington, Vt.**								
Burlington 2—8—2 Fertilizer	1.64	1.94	9.00	10.06	8.00	8.11	2 00	2.66
Burlington 2—8—3 Fertilizer	1.64	1.65	9.00	9.71	8.00	7.75	3.00	3.09
Burlington 2—8—10 Fertilizer	1.64	1.88	9.00	9 00	8.00	8.04	10.00	10.00
Burlington 4—8—7 Fertilizer	3.28	2.92	9.00	9.00	8.00	7.58	7.00	7.30

Analyses of Brands

	NITROGEN		PHOSPHORIC ACID				POTASH	
			Total		Available			
	Guaranteed	Found	Guaranteed	Found	Guaranteed	Found	Guaranteed	Found
CHICAGO FEED AND FERTILIZER COMPANY, Chicago, Ill.								
Sheep Manure, Magic Brand	1.84	1.67	1.50	5.29	.....	1.76	1.25	1.92
CONSOLIDATED RENDERING CO., Boston, Mass.								
Ground Tankage 6—30	4.92	5.22	14.00	17 40	.....	.....	.....	.....
High Grade Acid Phosphate	....	.....	16.50	17.12	16.00	15.59	.....	.....
Nitrate of Soda	15.50	15.79	.....	.....	.....	.....	.....	.....
JOHN C. DOW CO., Boston, Mass.								
Dow's Pure Ground Bone	2.00	2.19	24.00	26.60	.....	.....	.....	.....
EASTERN STATES FARMERS' EXCHANGE, Springfield, Mass.								
Eastern States 16% Acid Phosphate	....	.....	17.00	17.36	16.00	16.87	.....	.....
Eastern States 2—8—2 Fertilizer	1.65	1.67	.....	10.10	8.00	8.10	2 00	2.20
Eastern States 4—8—4 Fertilizer	3.29	3.17	.....	9.25	8.00	8.10	4.00	4.07
Eastern States 4—8—7 Fertilizer	3.29	3.02	.....	9.44	8.00	8 08	7.00	5.26
Eastern States 4—10—0 Fertilizer	3.29	3 13	.....	11.10	10.00	10.00	.....	.....

Essex Fertilizer Co. **Boston, Mass.**								
Essex 2—8—2 Farm and Garden	1.64	1.95	9.00	9.82	8 00	8.36	2.00	2.00
Essex Fish Fertilizer 3—8—3 for all crops	2.46	2.46	9.00	9.64	8.00	8.38	3.00	3.00
Essex Market Garden 3—8—4 for vegetables and grain	2 46	2.63	9.00	10.39	8.00	8 78	4.00	4.20
Essex 4—6—10 Potatoes and Vegetables	3.28	3.28	7.00	7.55	6.00	6.00	10.00	10.60
International Agricultural Corporation **Woburn, Mass.**								
Buffalo 16%	....	.....	17.00	17.62	16.00	16 21	.....	.....
Buffalo Economy	1.60	1.60	9 00	11.44	8.00	8.00	2.00	2.41
Buffalo High Grade Manure	3.30	3.31	7.00	7.65	6.00	6 77	10.00	10.42
Buffalo New England Special	1.60	1.64	11.00	12.56	10.00	10.85	4.00	4 00
Buffalo Phosphate and Potash	....	.....	11.00	11.48	10.00	10 72	8.00	8.00
Buffalo Vegetable and Potato	2.50	2.63	9.00	9 66	8.00	8.68	6.00	6.24
Lowell Fertilizer Co. **Boston, Mass.**								
Lowell 2—8—6 for grain, grass and potatoes	1.64	1.65	9.00	9.68	8.00	8 29	6.00	6.00
Lowell 3—6—10 for corn, potatoes and vegetables	2.46	2.25	7.00	7.28	6.00	6.23	10 00	10.17
Lowell 4—6—10 for potatoes and vegetables	3.28	3.37	7.00	7.72	6 00	6.18	10.00	10.33
Lowell 5—8—7 for potatoes and vegetables	4.10	4.10	9.00	9 79	8.00	7.66	7.00	7.62
Lowell 3—8—4 Animal Brand for all crops	2.46	2.65	9.00	10.32	8.00	8 53	4.00	4.13
Lowell 2—8—2 (Bone Fertilizer) for corn, grain, grass and vegetables	1.64	1.81	9.00	9.04	8.00	8.00	2 00	2.29
Lowell 4—7—2 Garden and Lawn Dressing	3.28	3.35	8.00	10.54	7 00	8.59	2.00	2.07
Lowell 4—8—6 Potatoes and Vegetables	3.28	3.36	9.00	9 96	8.00	7.79	6.00	6.13
Lowell 4—8—4 Potatoes, Corn and Vegetables	3.28	3.61	9.00	9.90	8.00	8 76	4.00	4.00
Lowell 2—8—3 Vegetables and Grain	1.64	1.59	9.00	9.10	8.00	8.05	3 00	3.07
Sulphate of Ammonia	20.50	20.84	.....	.....	.....	.....	.....	.....
Manchester Rendering Company **Manchester, N. H.**								
Manchester Animal Brand Potatoes and Vegetables	3.20	3.63	14.00	16 64	8.00	8.42	5.00	5.00
Manchester Ground Bone	2.00	2.82	.....	25.50	15.00	9 72	.....	.....
Manchester Special Fertilizer for all Crops	1.64	2.03	14.00	17.58	10.00	8.66	3 00	3.52
Manchester Tankage	5.75	5.87	.....	16.40	8.00	5.20	.....	.....

Analyses of Brands

	NITROGEN		PHOSPHORIC ACID				POTASH	
			Total		Available			
	Guaranteed	Found	Guaranteed	Found	Guaranteed	Found	Guaranteed	Found
MINE—THEODORE Whittenherm, Haut-Rhin								
Sels De Potasse	....	.....	.....	.....	.....	.....	.....	43.78
NEW ENGLAND FERTILIZER CO. Boston, Mass.								
New England 3—8—3 Corn, Grain, and Vegetables	2.46	2.49	9.00	10.04	8.00	8.78	3 00	3.15
New England Corn Phosphate 2—8—2	1.64	2.01	9.00	9.17	8.00	7.43	2 00	2.09
New England 3—6—10 Corn, Potatoes, and Vegetables	2.46	2.31	7.00	7 32	6.00	6.26	10.00	10.21
New England 2—8—6 Grain, Grass and Potatoes	1.64	1.83	9.00	8 78	8.00	7.80	6.00	6.00
New England 4—6—10 Potatoes and Vegetables	3 28	3.28	7.00	7.64	6.00	6.15	10.00	10.00
New England 4—8—4 Potatoes and Vegetables	3.28	3.41	9.00	9.97	8.00	8 00	4.00	4.06
New England 5—8—4 Potatoes and Vegetables	4.10	3.91	9.00	10.06	8.00	7.45	4.00	4.63
PACIFIC MANURE AND FERTILIZER COMPANY San Francisco, Cal.								
Sheep Manure, Groz-It Brand	1.84	1.39	1.25	0.98	0.75	0.79	3.00	1.96
PULVERIZED MANURE CO. Chicago, Ill.								
Wizard Brand Manure	2.00	2.20	.....	1.59	1.25	1.38	2 00	2.48
ROGERS AND HUBBARD CO. Portland, Conn.								
Corn and General Crops	2.46	2.69	10.00	11.30	8.00	8.51	6.00	6.00
Oats and Top Dressing	8.22	8.22	8.00	8.66	3.00	5.46	8.00	8.34
Potato Phosphate	1 64	2.03	9.00	10.88	8.00	8.00	4.00	4.41
Pure Raw Knuckle Bone Flour	4.00	4.24	25.60	26.28	.....	.....	.....	.....
Soluble Potato Manure	5 00	5.00	10.00	11.08	8.00	7.64	5.00	5.35